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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/840,629	04/23/2001	Jason W. Trobaugh	13297.00019	3963

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EXAMINER

MILLER, RYAN J

ART UNIT PAPER NUMBER

2621

DATE MAILED: 06/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/840,629

Applicant(s)

TROBAUGH ET AL.

Examiner

Ryan J. Miller

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-50 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 11, 12, 16, 17, 22, 23, 31, 34, 35, 43, 45, and 47-50 is/are rejected.
- 7) ☒ Claim(s) 5-10, 13-15, 18-21, 24-30, 32, 33, 36-42, 44 and 46 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 April 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>5</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Drawings

1. New corrected drawings are required in this application because of the objections raised by the official draftsman on the Form PTO-948 attached to this action. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Claim Objections

2. The following quotations of 37 CFR § 1.75(a) and (d)(1) are the basis of objection:

(a) The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

(d)(1) The claim or claims must conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description. (See § 1.58(a)).

3. Claims 22-44, 46, 47, 48, and 50 are objected to under 37 CFR § 1.75(a) as failing to particularly point out and distinctly claim the subject matter which the applicant regards as his invention or discovery.

Claims 22, 34, and 47 call for the claim language "performing a representation of the physical model". This language is grammatically awkward and difficult to understand. How does a system *perform a representation*? Does the applicant mean, "creating a representation"? Clarification of this issue is required.

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Claims 33, 46, and 50 call for the language, "performing a random phasor sum representation of the physical model". This language is grammatically awkward and difficult to understand. How does the system perform a random sum representation? Does the applicant mean, "creating a random sum representation"? Clarification of this issue is required.

Further regarding claims 22, 33, 34, 46, 47, and 50, these claims call for "creating a physical model". It is unclear from the applicant's disclosure whether this physical model is an actual material model that is imaged, or if this model exists in a virtual space such as a computer graphics representation. Clarification of this issue is required.

Claims 23-32 and 35-44 are objected to as depending from an objected to claim.

4. Claims 1-21, 23, 31-33, 35, 45, 46, 48, and 50 are objected to under 37 CFR § 1.75(d)(1) as failing to find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

Regarding claims 1, 23, 35, 45, and 48, these claims call for "developing a microstructure". While the term "microstructure" is used throughout the specification, a complete and thorough definition of a microstructure is not provided. Therefore, for examination purposes, the plain meaning of this word shall be used. Clarification of this issue is required.

Claims 33, 46, and 50 call for an equivalent limitation and are objected to for the same reasons.

Claims 2-21, 31, and 32 are objected to as depending from an objected to claim.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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6. Claims 47-50 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 47-50 are written with means plus function limitations. Therefore, 35 U.S.C. 112, sixth paragraph is invoked. However, the corresponding structure, material, or acts are not described in the specification in specific terms and one skilled in the art would not be able to identify the structure, material or acts from that description (see MPEP § 2181). Claim 48, for example, calls for means for forming imaging characteristics, means for forming shape, means for forming microstructure, and means for creating an image model. However, no structure of such means is described in the specification. The most detail that the specification provides is that the results are generated using algorithms coded in MAT-LAB and C++. However, the specification does not provide any specific programming modules for performing any of these features. Claims 47, 49, and 50 all have an equivalent problem as the one described above. Appropriate correction of this issue is required.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1, 3, 4, 12, 16, 17, 22, 23, 31, 34, 35, 43, 45, 47, and 48 are rejected under 35 U.S.C. 102(e) as being anticipated by Sheehan et al. (U.S. Patent No. 6,106,466 A).

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As applied to claim 1, Sheehan et al. disclose a method for forming an image model, comprising the steps of: a. developing imaging system characteristics (see Fig. 11: Reference numeral 212 referring to a physics model of ultrasound reflection and attenuation in and around heart (i.e. imaging system characteristics).); b. developing gross shape (see Fig. 11: Reference numeral 210 referring archetype shape (i.e. gross shape).); c. developing microstructure (see Fig. 11: Reference numeral 216 referring to structural model of cardiac anatomy (i.e. microstructure).); d. incorporating the imaging system characteristics, the gross shape and the microstructure to form the image model (see Fig. 11: As can be seen in the figure, 210, 212, and 216 are incorporated to form the ultrasound imaging model.).

As applied to claim 3, Sheehan et al. disclose that the image model includes a data likelihood enabling a statistical inference to formulate underlying characteristics (see column 14, lines 22-26: The reference describes that the image model is based on a knowledge base of ventricular shapes defined by rotations, translations, and scaling of the set of training data (i.e. data likelihood) with the estimated covariance matrix for each of the vertices of the archetype shape (i.e. enabling a statistical inference).).

As applied to claim 4, Sheehan et al. disclose that the data likelihood is developed using image pixel based statistics (see column 14, lines 22-26: The reference describes that the training data set (i.e. data likelihood) is developed using an estimated covariance matrix for each of the vertices (i.e. image pixel based statistics).).

As applied to claim 12, Sheehan et al. disclose that tissue is characterized by a reflectivity function (see column 10, lines 8-15: The reference describes that the epicardial surface of the

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heart (i.e. tissue) can be characterized by the reflected intensity of a sound wave (i.e. reflectivity function) as provided for in equation (5).)

As applied to claim 16, Sheehan et al. disclose that the gross shape is described by a triangulated surface (see Fig. 8: As can be seen in the figure, the archetype model (i.e. gross shape) is described by a triangulated surface.).

As applied to claim 17, Sheehan et al. disclose that the triangulated surface includes a set of triangular elements defined by respective vertices and edges of the triangular elements (see Fig. 8: As can be seen in the figure, the triangulated surface includes a set of triangular elements defined by respective vertices and edges of the triangular elements.).

As applied to claim 22, Sheehan et al. disclose a method for forming a physically-based, probabilistic model for ultrasonic images, comprising the steps of: a. creating a physical model of image formation (see Fig. 11: This figure illustrates the construction of a physical model.); and b. performing a representation of the physical model to form the probabilistic model (see Fig. 1 and column 17, lines 13-20: The reference describes that the mesh model (i.e. physical model) is adjusted to yield a three-dimensional surface that best represents the shape of the patient's heart (i.e. probabilistic model).).

As applied to claim 23, Sheehan et al. disclose that creating the physical model includes: a. forming imaging system characteristics (see Fig. 11: Reference numeral 212 referring to a physics model of ultrasound reflection and attenuation in and around heart (i.e. imaging system characteristics).); b. forming shape (see Fig. 11: Reference numeral 210 referring archetype shape (i.e. shape).); c. forming microstructure (see Fig. 11: Reference numeral 216 referring to structural model of cardiac anatomy (i.e. microstructure).); and d. incorporating the imaging

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system characteristics, the shape and the microstructure to create the physical model (see Fig. 11: As can be seen in the figure, 210, 212, and 216 are incorporated to form the ultrasound imaging model.).

As applied to claim 31, Sheehan et al. disclose that the microstructure is formed using image pixel-based statistics. The reference describes that the training data set (i.e. microstructure) is formed using an estimated covariance matrix for each of the vertices (i.e. image pixel based statistics).).

As applied to claims 34, 35, 43, and 47, which merely call for which merely call for a computer readable medium that configures a computer to perform the method of claims 22, 23, and 31, Sheehan et al. disclose such a computer readable medium since all of the processing performed in Sheehan et al. is performed by CPU 52 (see Fig. 2).

As applied to claims 45 and 48, which merely call for a computer readable medium that configures a computer to perform the method of claim 1, Sheehan et al. disclose such a computer readable medium since all of the processing performed in Sheehan et al. is performed by CPU 52 (see Fig. 2).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 2 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Sheehan et al. (U.S. Patent No. 6,106,466 A) and Seyed-Bolorforosh (U.S. Patent

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No. 5,841,889 A). The arguments as to the relevance of Sheehan et al. in the rejection of claim 1 above are incorporated herein.

Claim 2, which is representative of claim 11, calls for the imaging system characteristics to be developed using a three-dimensional point spread function.

This element is absent from Sheehan et al.; however, Seyed-Bolorforosh, in the same field of endeavor of image processing and the same problem solving area of ultrasound imaging discloses such a feature (see column 3, lines 46-50: The reference describes the use of a three-dimensional point spread function.).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Sheehan et al. by describing the imaging system characteristics using a three-dimensional point spread function as taught in Seyed-Bolorforosh because the use of such a three-dimensional point spread function gives the system the “ability to distinguish between different tissue types in a clinical ultrasound image” (see Seyed-Bolorforosh: column 3, lines 59-60).

Allowable Subject Matter

11. Claims 5-10, 13-15, 18-21, 24-30, 32, 36-42, and 44 would be allowable if rewritten to overcome the objections under 37 CFR 1.75, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

12. Claims 33 and 46 would be allowable if rewritten or amended to overcome the objections under 37 CFR 1.75, set forth in this Office action.

13. Claim 49 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action.

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14. Claim 50 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, second paragraph and the objection under 37 CFR 1.75, set forth in this Office action.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Trobaugh et al. (the article titled "A Physically Based, Probabilistic Model for Ultrasonic Images Incorporating Shape, Microstructure, and System Characteristics") and Trobaugh et al. (the article titled "A Discrete-Scatterer Model for Ultrasonic Images of Rough Surfaces") are pertinent in that each of the references disclose systems similar to the disclosed and claimed invention. However, these references do not qualify as prior art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ryan J. Miller whose telephone number is (703) 306-4142. The examiner can normally be reached on M-F 8:00-4:30.

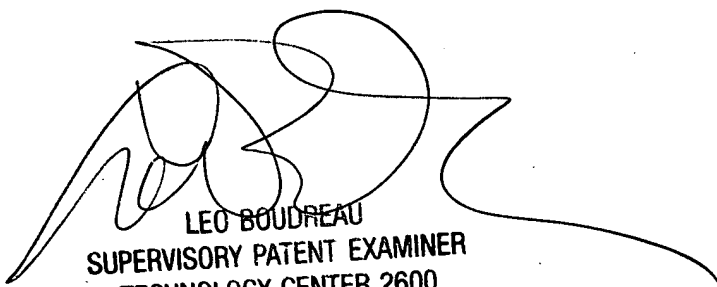
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703) 305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Ryan J. Miller

Ryan J. Miller
Examiner
Art Unit 2621


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